A NEW SPECIES OF *LERISTA* (SCINCIDAE) FROM CENTRAL QUEENSLAND

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Lerista chordae sp. nov. from the Desert Uplands Bioregion of central Queensland is a small skink with tetradactyl limbs and a moveable eyelid. It is readily distinguished from its congeners by the combination of fore-limb only 35-52% of hind-limb length; 2 phalanges and 3 subdigital lamellae on the 4th finger; ear aperture similar size or smaller than nostril; normally 20 midbody scale rows; four lines of dark flecks on dorsum; an ill-defined dark dorsolateral zone encompassing two half-scale widths only; an immaculate white vent and tail pale yellow in spirit. The new species occurs in open *Eucalyptus* woodlands characterized by very sandy soils and a sparse to dense ground cover of spinifex or other tussock grasses. The morphologically similar species *Lerista quadrivincula*, known from a single specimen, is redescribed. ❑ *Lerista, skink, new species, desert uplands, central Queensland.*

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The Desert Uplands Bioregion of central Queensland is an area of *Acacia* and *Eucalyptus* woodlands, dune systems and grasslands bordering the Einasleigh Uplands, Mitchell Grass Downs and the Northern Brigalow Belt between Charters Towers, Hughenden and Blackall. It has been little surveyed in comparison with nearby coastal eastern Queensland. Its biodiversity potential has probably been under-appreciated. Recent surveys have resulted in the discovery of a new species of *Ctenotus* (Couper et al., 2002) and a new species of *Lerista*, described herein. This suggests that the inhabitants of the diverse habitats of this bioregion especially the smaller, cryptic species, may be worth closer scrutiny, particularly as pressure for more intensive development for pastoral activity increases.

Lerista is the second largest reptile genus in Australia (after *Ctenotus*) with 79 species recognised at the end of 2003. While many species are common and widespread, many others are known from only a few specimens from few or remote localities; *L. bunglebungle* Storr, 1991, *L. praefrontalis* Greer, 1986, *L. quadrivincula* Shea, 1991 and *L. speciosa* Storr, 1990 are recorded solely from the holotype. Knowledge of intra- and inter-specific variation is therefore very patchy within this genus.

As has been pointed out elsewhere (Greer, 1987, 1989, 1990b), the remarkable range of limb reduction within the genus, from the full 5 digit condition to limbs entirely absent, even varying within a species, offers rich possibilities for study of the evolutionary processes driving this condition. The dire situation of *Lerista allanae*, possibly Australia's first reptile species to be driven to extinction by human activities (Covacevich et al., 1996), exemplifies the need for sound taxonomic assessment of cryptic taxa as an aid in determining conservation priorities.

METHODS

Part of the type series, the first specimens to be identified, was collected during broadscale surveys conducted within the Desert Uplands to assess the patterns of vertebrate assemblage and distribution (Kutt, 2003). Sampling methods are described in Couper et al. (2002). The rest of the type series, including the holotype, was collected by hand opportunistically along the Torrens Creek-Aramac Rd. These specimens were hiding in loose bark or small partly buried branches, in sandy patches in a generally clay-soil terrain.

All body measurements were taken using Mitutoyo electronic calipers. Scales were counted on the right side only of specimens examined. The total number of enlarged nuchals is given. Presacral vertebrae, caudal vertebrae and phalanges were counted on X-ray photographs taken with a Torrex 120D X-ray inspection system using 50kV, 50mA, 50s exposure. Only original tails were included in the morphometric analysis (assessed by X-ray). Abbreviations for body measurements are as follows: snout-vent

length (SVL); axilla to groin (AG); original tail length (vent to tip, TL); fore-limb (axilla to tip of longest finger, L1); hind-limb (groin to tip of longest toe, L2); snout-axilla (SA); head width (widest point, HW); head length (tip of snout to posterior margin of parietals, HL); eye to ear (posterior margin of orbit to dorsal anterior margin of ear, EE). Scalation definitions follow Horner (1992). Other abbreviations used: Queensland Museum (QM), South Australian Museum (SAM), standard deviation (SD). For comparison, all species of the *Lerista frosti* group (*L. dorsalis*, *L. flammicauda*, *L. frosti*, *L. quadrivincula* and *L. zietzi*) were examined using museum specimens.

SYSTEMATICS

The new species is assigned to *Lerista* Bell, 1833, following the revised diagnosis of Greer (1986). It conforms to the *frosti* group (Storr et al., 1999), with moveable eyelids, a 4 + 4 digital formula, 3 supraoculars, 5 supraciliaries, 6 upper labials and midbody scales in 18-22 rows. These plesiomorphic characters are widespread in *Lerista* (Greer, 1986, 1990a) and so membership of the group does not necessarily imply close phylogenetic relationship between group members.

Lerista chordae sp. nov.
(Figs 1, 2)

ETYMOLOGY. Latin *chordae*, strings of a lyre, in reference to the thin black lines on the dorsum.

MATERIAL. HOLOTYPE QMJ81070 Torrens Creek-Aramac Rd, 40km S Torrens Creek (21°05'30"S 145°00'16"E). PARATYPES QMJ72754-5 Bede Stn, 100km NNE of Aramac (22°22'37"S, 145°35'32"E), QMJ74034 Ulva Stn, 100km S of Torrens Creek (21°25'00"S, 145°08'45"E), QMJ81071 22km (road) S of Torrens Creek (20°59'09"S 145°01'54"E), SAMR55681-4 Torrens Creek-Aramac Rd, 40km S Torrens Creek (21°05'30"S 145°00'16"E). See Fig. 3 for map of collection localities.

DIAGNOSIS. Readily distinguished from all other *Lerista* by the combination of smaller size (max. SVL 45.10mm), lower eyelid moveable; ear aperture similar size to nostril; four digits on fore- and hindlimbs, forelimb 35-52% of hindlimb length; 2 phalanges and 3 subdigital lamellae on 4th finger; normally 20 midbody scale rows; 36-38 presacral vertebrae; four lines of dark flecks on dorsum; an ill defined dark dorsolateral zone encompassing two half-scale widths only; an immaculate white vent and tail pale yellow in spirit.

DESCRIPTION. Measurements. SVL (mm) 29.28-45.10 (mean=38.27, SD=5.59, n=9). Proportions (% SVL): AG=61.82–69.55 (mean=65.79, SD=2.34, n=9); TL=112.78-130.08 (mean=119.62, SD=9.20, n=3); L1=9.76–13.63 (mean=11.71, SD=1.24, n = 8); L2=18.76–32.54 (mean=25.82, SD=4.14, n=9); HL=12.17-14.46 (mean=13.15, SD=0.98, n=9), SA=25.68-31.19 (mean=28.56, SD=2.00, n=9). Proportions (% L2): L1=35.62-52.03 (mean=45.48, SD=5.07, n=8). Proportions (% HL): HW=52.42–64.62 (mean=57.11, SD=3.89, n=9); EE=38.91-49.69 (mean=41.80, SD=3.42, n=9).

Scalation. Rostral crescent-shaped with triangular medial projection between nasals; nasals separated (n = 7) or in contact (n=2), nostril placed anteriorly and laterally; frontonasal wider than long, saddle-shaped, triangular anteriorly between nasals to meet or just fail to meet rostral, concave posteriorly; frontal longer than wide, somewhat coffin-shaped, contacts frontonasal, prefrontals, first 2 supraoculars and frontoparietals; 3 supraoculars, 2nd the largest; supraciliaries 5, rarely 4 (QMJ81071 one side only), 1st, 3rd and 4th project between prefrontal and 1st supraocular, 1st and 2nd supraocular, 2nd and 3rd supraocular respectively; palpebrals 5 rarely 6 (QMJ72755); frontoparietals paired and distinct; interparietal distinct, angular anteriorly, rounded posteriorly; parietals in broad contact behind interparietal; 2-6 enlarged nuchals; loreals 2, 1st largest; 2 preoculars, 1 presubocular; 2 postoculars, 1 postsubocular; primary temporal in contact with pretemporal, secondary temporal, 5th and 6th supralabials; secondary temporal in broad contact with parietal, primary temporal and point contact with pretemporal; supralabials 6, 4th subocular; infralabials 6, 2 contacting postmental; 2 additional rows of enlarged chin shields; ear opening circular to vertically elliptic, similar size to nostril; midbody scale rows 20, rarely 18 (QMJ81071, SAMR55681); paravertebrals 68-75 (mean=72.33, SD=3.08, n=9); lamellae beneath 4th finger 3 (n=8); supradigitals above 4th finger 2 (n=8); lamellae beneath 4th toe 5, rarely 4 (SAMR55682, QMJ72754 one side only) or 6 (SAMR55682, R55684 one side only); supradigitals above 4th toe 4 rarely 3 (QMJ72755, J81071, SAMR55681 one side only) or 5 (SAMR55684 both sides); lamellae beneath longest toe (3rd) 13-16 (mean 14.44, SD =1.01, n=9); supradigitals above longest toe

FIG. 1. One of the paratypes of *Lerista chordae* in life, Torrens Creek-Aramac Rd (21°05'30"S 145°00'16"E).

(3rd) 9-12 (mean=10.11, SD=0.93, n=9); subcaudals 78-81 (mean=79.33, SD=1.53, n=3).

Osteology. Presacral vertebrae 36-38 (mean= 37.33, SD=0.87, n=9) and caudal vertebrae 42 (n =3). Phalangeal formula of fore-limb 0.2.3.4.2 (n =4), hind-limb 0.2.3.5.3 (n=7).

Holotype. Measurements and scale counts for the holotype are as follows: Sex: male (determined by dissection); SVL =42.79mm; AG=28.50mm; TL=55.66mm; L1=4.84mm; L2=9.84mm; HL=5.37mm; HW=3.00mm; EE=2.13mm; SA= 12.08mm; nasals separated, enlarged nuchals 6, supraciliaries 5, palpebrals 5, ear opening circular, midbody scale rows 20, paravertebrals 75, lamellae beneath 4th finger 3; supradigitals above 4th finger 3; lamellae beneath 4th toe 5, supradigitals above 4th toe 4, lamellae beneath longest toe (3rd) 15, supradigitals above longest toe (3rd) 12, subcaudals 78. Presacral vertebrae 37, caudal vertebrae 42.

Colour Pattern (In Spirit). Dorsal ground colour grey-brown to bronze. Four longitudinal lines of fine dark chocolate brown spots running from nape to base of tail, breaking up into irregular flecking along tail, outer pair sometimes discontinuous (SAMR55681). Chocolate brown dorsolateral band from rostral to base of tail, 2 half-scale widths on flanks, ill-defined, continuing along tail where it breaks up into irregular flecking and tends to merge with dorsal flecks. Head with dark, fine flecks above. A dark vertical medial bar through rostral scale. Pale limbs mottled with dark brown above. Tail very pale yellow in spirit. Ventral surfaces immaculate white, very pale yellow on tail. Supralabials lightly to strongly edged with brown/black, sometimes infralabials also (QMJ72754-5). Lateral scales edged with dark brown/black merging with dark dorsolateral band. Regrown tail may be immaculate pale yellow (SAMR55684). In life, juveniles have bright red tail colouring (brightest on the ventral surface), the colour in adults being pale orange-yellow.

Variation in Paratypes. Quantitative variation in scale characters and osteology among paratypes is given above. Paratypes varied in the degree of dark markings, from 2 faint rows of spots on the dorsum, light flecking on the top of the head and no labial edging (SAMR55681) to 4 broken lines dorsally (QMJ81071), heavy flecking on the top of the head (QMJ74034) and heavy edging on the supralabials (QMJ72754 and J75755). Sex was known for only 3 individuals (QMJ81070, SAMR55682 and R55683, examination through incision made for tissue sampling), which were all males. These exhibited wide variability in characters normally associated with sexual dimorphism in *Lerista*. For example, the number of presacral vertebrae is commonly higher in females than males (Greer, 1987, 1990b) while in the 3 known males, these ranged between 36 and

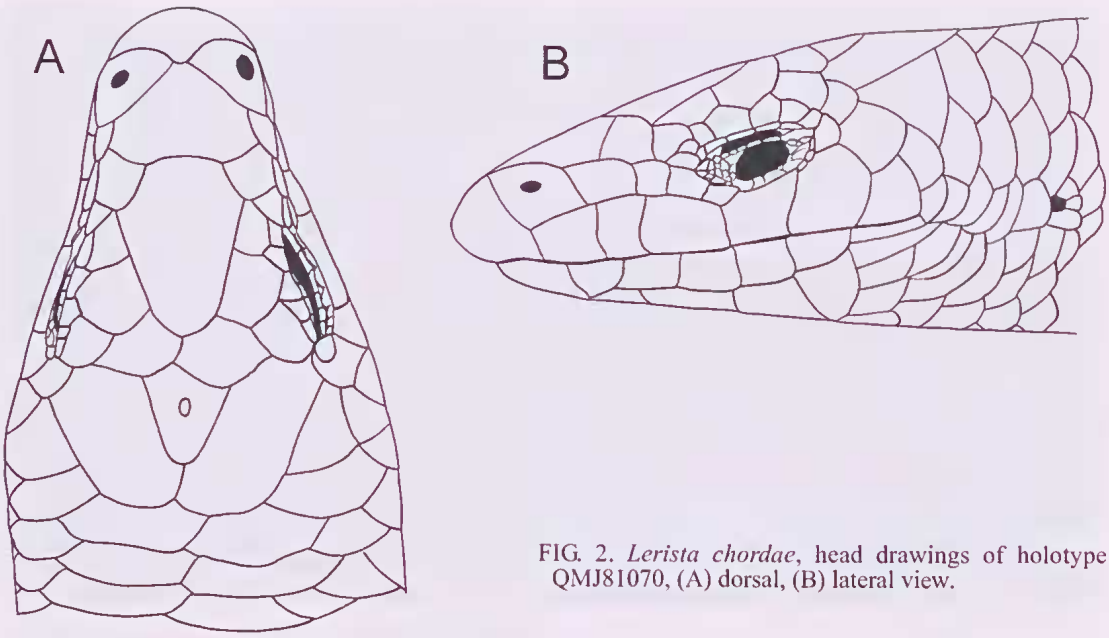

FIG. 2. *Lerista chordae*, head drawings of holotype QMJ81070, (A) dorsal, (B) lateral view.

38, the total range for the species. Consequently, it was thought unnecessarily destructive to determine sex of the other individuals, and therefore any dimorphic characters.

Comparison with Other Species. The combination of tetradactyl fore- and hind-limbs and a movable eyelid distinguishes this species from all currently described *Lerista* except *L. dorsalis*, *L. flammicauda*, *L. frosti*, *L. quadrivincula* and *L. zietzi*. Nasals normally widely separated, nostril similar size to ear aperture, short fore-limbs (35-52% of hind-limb) with digital formula 0.2.3.4.2, 3 subdigital lamellae on the 4th finger, dorsum with 4 longitudinal lines of flecks, and narrow, ill-defined dorsolateral band separate this species from *L. flammicauda* and *L. zietzi* (nasals usually in contact, ear aperture larger than nostril, fore-limbs with digital formula 0.2.3.4.3, 52-77% hind-limb with 5-7 lamellae on 4th finger or 63-77% hind-limb with 6-7 lamellae on 4th finger respectively, dorsum either immaculate or 2-4 narrow, discontinuous lines of flecks on nape or rump, dorsolateral band 2 scales wide, solid and sharp-edged or narrow but solid and well-defined dorsally). It is distinguished from *L. dorsalis* and *L. frosti* by an irregular dark dorsolateral stripe (vs. a wide, sharp-edged and solid dorsolateral and its immaculate ventral surface (vs. darkly edged ventral scales). It is further distinguished from *L. dorsalis* by the fore-limb digital formula 0.2.3.4.2 (vs 0.2.3.4.3) and 3 lamellae on the 4th finger vs. 4-6 lamellae. It is distinguished from *L. quadrivincula* by smaller size (maximum SVL 45.10mm vs 51.13mm), fewer presacral vertebrae (36-38 vs 42) and a pale yellow tail differently coloured to the body, immaculate below vs. tail same colour as body, reticulated below. *Lerista quadrivincula* is known from a single specimen from the arid northwest coast of the Pilbara, WA, ~ 2,500km west of the known distribution of *L. chordae*.

DISTRIBUTION. *Lerista chordae* occurs in the Desert Uplands, within an area encompassing a central zone of yellow and red sandy earths (20°-23°S) and, to the immediate west, alluvial sand plains (Fig. 3). It is associated with two open woodland vegetation types (see Habitat).

HABITAT. *Lerista chordae* is a fossorial lizard occurring in open woodlands on sandy soils with a predominantly spinifex or other tussock grass dominated ground cover. It was found in 2 associated regional ecosystems types in the Desert Uplands bioregion. The specimens from Bede Station were trapped in the low, open *Eucalyptus similis* (yellowjacket), *Corymbia brachycarpa*, *C. setosa* (bloodwood) and *C. dallachiana* (ghost gum) woodlands with a moderate to dense spinifex (*Triodia pungens*) ground cover that is mediated by fire-age and grazing intensity (regional ecosystem 10.5.1 and 10.5.2, Sattler & Williams, 1999). This

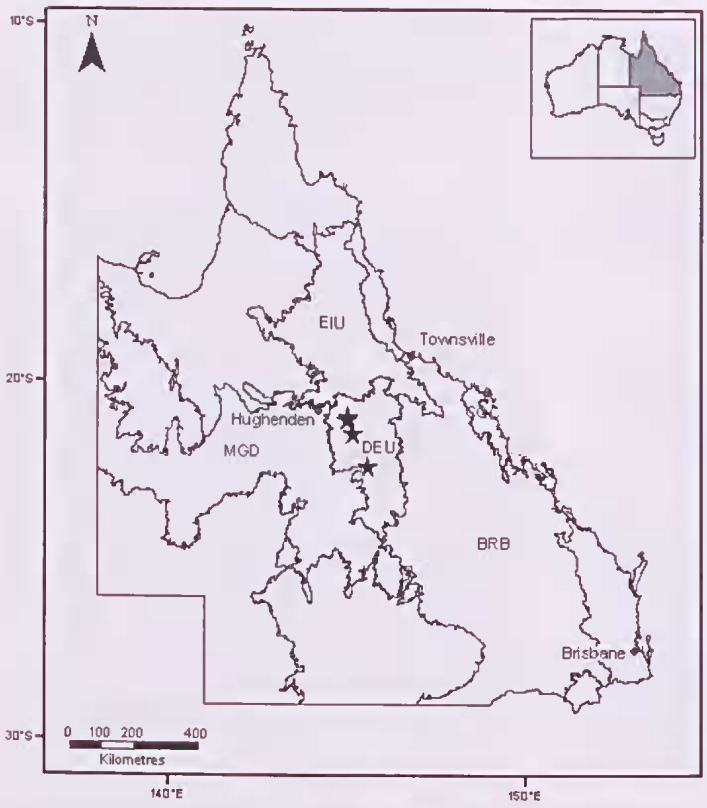

FIG 3. Map of collection localities of *Lerista chordae* in the Desert Uplands bioregion. EIU = Einasleigh Uplands, MGD = Mitchell Grass Downs, DEU = Desert Uplands, BRB = Brigalow Belt. Map sources: AUSLIG (1992), Queensland Herbarium June (2001), Queensland Environmental Protection Agency (1998).

vegetation is widespread and occurs on the extensive, uniform, gently undulating Cainozoic sand deposits along the Great Dividing Range. Another recently described reptile for the Desert Uplands, *Ctenotus rosarium* Couper et al., 2002, also occurs in this vegetation type. The specimens from Bede Station were captured in a pitfall trap from a long unburnt site (>8 years), where the habitat was characterised by dense spinifex cover (>60%).

At Ulva Station and the sites south of Torrens Creek, specimens were located on small sandy rises within old alluvial sand plains. These sandy rises are dominated by mixed bloodwood and gum open woodlands (*Corymbia terminalis*, *C. dallachiana*, *C. plena*) with a variable lower tree storey and shrub layer containing species such as *Grevillea parallela*, *Carissa lanceolata*, *Eremophila mitchelli* and *Acacia* spp. These patches are usually interspersed within more extensive Whites Ironbark (*Eucalyptus whitei*) communities. The ground layer is sparse, frequently dominated by *Triodia pungens*, with other graminoids such as *Aristida* spp., *Paraneurachne muelleri*, *Heteropogon contortus*, and *Eriachne mucronata* (present regional ecosystem 10.3.10 in mosaic with 10.3.9, Sattler & Williams, 1999). The soils consist of deep, unconsolidated sands, much like dune rises. This vegetation type occurs west and adjacent to the Cainozoic sand sheets described above, and on extensive sand sheets on the ancestral floodplains of the Flinders River (now centred on Torrens Creek). The specimen from Ulva Station was hand-captured and found sheltering under a log. At this locality the habitat was characterised by having a moderate tussock grass, forb and litter layer (>50%), and a discrete mid-storey shrub layer.

DISCUSSION

Lerista chordae is morphologically close to *L. dorsalis*, to which it would key in Cogger (2000) by virtue of its 4/4 digital formula, moveable eyelid, ear opening same size as nostril and well-developed dorsal stripes. Its 4/4 digital formula, moveable eyelid, 3 supraoculars, 5 supraciliaries, 6 upper labials and 18-20 midbody scale rows places it in the *L. frosti* group of Storr et al. (1999) along with *L. dorsalis*, *L. flammicauda*, *L. frosti*, *L. quadrivincula* and *L. zietzi*, and the more broadly defined *L. elegans* group of Wilson & Knowles (1988). However, none of the species groups within *Lerista* have been tested genetically so their phylogenetic validity is unknown. Some morphological character states have been used by Greer (Greer et al., 1983, Greer, 1986, 1990a) to redefine some species groups on the basis of synapomorphies, but most remain no more than aids to rapid identification. Work on the evolutionary relationships among species of *Lerista* is in progress using DNA sequence data and morphology (pers. comm. Adam Skinner, SA Museum and University of Adelaide). Preliminary data

from both mitochondrial nuclear sequences consistently support the clade ((*L. fragilis*, *L. chordae*), *L. frosti*)) but fail to find a close relationship between these three and *L. dorsalis*. While future work may better resolve relationships, it is clear at the present time that the DNA evidence supports recognition of *L. chordae* as a distinct species from *L. dorsalis*, and further suggests that its nearest relatives are more likely to be northern Australian taxa rather than the geographically remote *L. dorsalis*.

In the light of the DNA information obtained so far, the extra phalanx on the fourth finger of *L. dorsalis* is intriguing. This character separates it from *L. chordae* as well as all other members of the *L. frosti* group. No variation was observed in these characters, in contrast to Greer's (1987, 1990b) findings of up to 9.5% within a species, although our sample sizes are small, as phalanges were not always clearly visible in X-ray photographs (*L. chordae* n = 9; *L. dorsalis* n = 26; *L. flammicauda* n = 4; *L. frosti* n = 7; *L. zietzi* n = 7). Any functional significance of such a small difference is unclear. However, the sequence from *L. dorsalis* to other members of the *L. frosti* group (0.2.3.4.3 → 0.2.3.4.2) fits within the schema of progressive limblessness within *Lerista* given by Greer (1990b).

The type of *L. quadriviucula*, as a member of the *L. frosti* morphological group, was examined for this study. This is the only known specimen of this species. As the type description (Storr, 1990) is brief, a redescription, based on our observations, is included here in the Appendix. No significant inconsistencies between Storr's description and our observations were noted.

A number of potential threats to the populations of *L. chordae* can be identified. The location of specimens in long unburnt spinifex at Bede Station suggests that the persistence of a high ground and litter cover is required by this species. However, introduced Buffel Grass (*Cenchrus ciliaris*), which can alter and increase the fire intensity in spinifex communities is invading these ecosystems (Morgan et al., 2002). Furthermore regional ecosystem 10.3.10 and 10.3.9 in the Torrens Creek region has in recent years been heavily targeted for land clearing, with a further 40% (>100,000ha) proposed (Morgan et al., 2002). Cattle grazing in general can cause dramatic changes to ground cover, which may have some impact on fossorial species (Woinarski et al., 2001). Though these threats are in part speculative and may seem exaggerated, the case of *Lerista allanae*, a species distributed on the eastern edge of the Desert Uplands and now considered probably extinct (Covacevich et al., 1996), suggests that even small reptiles are susceptible to long-term threats of land cover change associated with agriculture.

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APPENDIX

Redescription of *Lerista quadrivincula* Shea 1991 (original description by Storr, 1990, as *Lerista concolor*, a junior subjective homonym of *Lygosoma (Rhodona) bipes concolor* Werner, 1910, see Shea, 1991). Head scale diagrams are provided in Storr (1990).

Measurements. SVL (mm) = 51.13. Proportions (%SVL): AG = 67.40; tail broken; L1 = 11.32; L2 = 22.00; HL = 11.34, SA = 26.58. Proportions (%L2): L1 = 51.47. Proportions (%HL): HW = 63.10; EE = 48.62.

Scalation. Rostral crescent-shaped with triangular medial projection between nasals; nasals narrowly separated, nostril placed medially; frontonasal wider than long, saddle-shaped, triangular anteriorly between nasals to meet rostral, slightly concave posteriorly; frontal longer than wide, somewhat coffin-shaped, contacts frontonasal, prefrontals, first 2 supraoculars and frontoparietals; 3 supraoculars, 2nd the largest; supraciliaries 5, 1st, 3rd and 4th project between prefrontal and 1st supraoculars to contact frontal, 1st and 2nd supraocular, 2nd and 3rd supraocular respectively; palpebrals 7; frontoparietals paired and distinct; interparietal distinct, angular anteriorly, rounded posteriorly, overlapped by right parietal; parietals in contact behind interparietal; 4 enlarged nuchals; loreals 2, 1st largest; 2 preoculars, 1 presubocular; 2 postoculars, 1 postsubocular; primary temporal in contact with pretemporal, secondary temporal, 5th and 6th supralabials; secondary temporal in broad contact with parietal, primary temporal and pretemporal; supralabials 6, 4th suboecular; infralabials 6, 2 contacting postmental; 2 additional rows of enlarged chin shields; ear opening circular, same size as nostril; midbody scale rows 20; paravertebrals 78; lamellae beneath 4th toe 7; supradigitals above 4th toe 5; lamellae beneath longest toe (3rd) 17; supradigitals above longest toe (3rd) 11.

Osteology. Presacral vertebrae 41. Fore-limb phalangeal formula 0.2.3.4.2, hind-limb 0.2.3.5.3.

Colour Pattern. Ground colour brown. Four longitudinal lines of discontinuous chocolate brown flecks running from nape to base of tail, breaking up into irregular flecking along tail. Chocolate brown dorsolateral band from nasal to base of tail, two half-scale widths on flanks, ill-defined, continuing along tail where it breaks up into irregular flecking merging with dorsal flecks and reticulate pattern ventrally. Head with sparse dark, fine flecks above. Limbs mottled with dark brown above. Tail same colour as body. Ventral surfaces immaculate except for reticulate pattern on tail. Supralabials edged with dark brown, some edging on infralabials also. Lateral scales mottled with dark brown merging with dorsolateral band.